DOSSIER TÈCNIC
TRAINING AND ADVICE IN THE FOOD AND AGRICULTURE SECTOR

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CULTIVATED BIODIVERSITY

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Generalitat de Catalunya
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INTRODUCTION

Neus Ferrete Gracia
Deputy Director General for Agriculture

In an international scenario of climate change and globalisation, traditional varieties and their seeds are a very important genetic resource which were undervalued in the twentieth century. However, they are now assuming an increasingly important role in the new circumstances that are becoming apparent.

Traditional varieties are well adapted to their regions of origin, and their intrinsic variability provides agricultural systems some degree of stability.

The rational and sustainable use of this local plant material means that the natural biodiversity of agrarian ecosystems can be preserved, and it is essential for sustainable economic development.

Cultivated biodiversity is the result of a long selection process of seeds and plants undertaken by the farmers in each region of Catalonia, from generation to generation, involving traditional agricultural practices that in some cases are also at risk of disappearing, due to the intensification of agriculture and industrialisation in the country. It is important to preserve this genetic heritage for this reason, while conserving the associated cultural heritage and ethnobotanical aspects, such as the agricultural practices that our ancestors used, ancient remedies using medicinal plants and recipes in traditional cuisine is even more important.

Given its significance, the Ministry of Agriculture, Livestock, Fisheries and Food (DARP) is committed to the conservation, study and recovery of traditional varieties, because they are part of the country's agricultural biodiversity and its genetic heritage. A holistic approach to the preservation of traditional varieties is required for this reason, because there are many factors involved which need to be considered on a multidisciplinary basis using various strategies (*ex situ, in situ* or in the field). All of them are useful in themselves, but taken together, they have been shown to be the path towards the effective conservation of cultivated biodiversity.

The DARP has created the Local Varieties Seed Bank of Catalonia, which aims to be the reservoir for Catalonia's local varieties – varieties which will be mostly registered in the Catalogue of local varieties of agricultural interest. This *ex situ* conservation system is very important, but due to its very nature, it is insufficient since without farmers and organisations cultivating traditional varieties on the ground, this conservation work will not be effective.

Catalonia currently has an extensive network of organisations and associations working to conserve cultivated biodiversity. As a government institution, the DARP aims to be the focus that provides coordination and acts as a catalyst to foster positive synergies between all these organisations.

This *Technical Dossier* has two objectives: first, to raise awareness of the importance of phytogenetic resources, in local Catalan varieties in particular; and second, to raise the profile of all the organisations and associations that are working to conserve this cultivated biodiversity in Catalonia.

Finally, we would like to express our thanks to the organisations that have helped to produce this *Technical Dossier*, because their work often does not receive the recognition it deserves.

We hope that you will also be grateful to them after reading this dossier!

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The future is in our hands.
Photograph: Rosa Mari Pedrol Esteve

JOSÉ T. ESQUINAS ALCÁZAR

'WE MUST PROTECT LOCAL VARIETIES PRECISELY BECAUSE THEIR VALUE IS INCALCULABLE'

In this interview, we discuss biodiversity in broad and overall terms with **doctor José T. Esquinas,** who worked as an expert for the Food and Agriculture Organization of the United Nations (FAO) for 30 years, serving as Secretary General of the Intergovernmental Commission on Genetic Resources for Food and Agriculture, secretary of the International Treaty on Plant Genetic Resources and chair of the Committee on Ethics in Food and Agriculture..

Figure 1. *José T. Esquinas Alcázar.*

What are agricultural biodiversity and phytogenetic resources? Why are they important?

Agricultural biological diversity and its genetic resources provide the raw material that rural communities and scientists use to improve the productivity and quality of agricultural products, combining the use of traditional technologies and new technologies. These natural resources – which are limited and perishable – are the cornerstone of global food security. They are also a stock of genetic adaptability for the future, which will enable future generations to adapt to unpredictable climates and environmental changes. Because of their fundamental role in food production, phytogenetic resources are known as 'green gold' and can be thought of as humanity's larder.

According to FAO figures, mankind has cultivated between 7,000 and 10,000 different plant species in history, but only 150 are used commercially today; and of those, a mere four (wheat, rice, corn and potatoes) account for more than 60% of human calorie intake. Furthermore, there has been a huge loss of genetic diversity among those 'commercial species' over the last century, with a sharp reduction in the number of varieties of each species cultivated, as well as in their intravarietal genetic diversity.

Diversity is an important factor for adapting to both environmental and human changes. Plants that belong to a uniform and stable variety are all the same, which means they have no differences that provide an adaptive advantage that can be selected. Commercial varieties have this uniformity; on the other hand, traditional varieties have a diversity that means that nature and farmers can select the specimens that best suit local conditions and needs. They are also the varieties that scientists need in order to find the characteristics they are looking for. It is important to maintain this diversity, because you never know which of these characteristics could be important in the future – changes are often unpredictable...

Could you give us an example?

There was a major famine in Europe at the end of the nineteenth century, because of a disease that destroyed the potato crop. The potato is a crop originally from Latin America, which was brought to Europe in the sixteenth century. It ended up being one of the most important crops, especially in areas where wheat and other cereals did not adapt very well, such as the wet regions of central Europe and on islands such as Ireland. However, the fungus *Phytophthora infestans* killed virtually all the potatoes, which were a staple food for millions of people, between 1845 and 1849. Nothing seemed to solve the problem – neither insecticides or pesticides – until someone had the bright idea of looking for a solution in the place where it came from and the source of the potato's diversity, in countries like Peru. There they discovered that European potatoes, which were round, brown on the outside and white on the inside, were just one among many varieties of American potato, which can come in different sizes and colours (ranging from purple or blue to white) and have different tastes. They also found that most are resistant to *Phytophthora infestans*, and they imported a similar one to which the Europeans were used to into Europe. That was how the problem was solved.

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The twentieth century saw the loss of between 70% and 90% of agricultural diversity worldwide.

Another case, closer to us in chronological terms, involved the loss of corn crops in the southern United States in the 1970s due to *Helmintosporius* maydis. This corn came from an hybrid produced using a single variety as an androsterility donor. Pesticides also failed to work in this case, and they found the resistance in an African strain of corn.

Figure 2. *Diversity in barley, tropical fruits, sorghum, beans, cocoa, corn, melon and potato. Source: José T. Esquinas.*

Another case in the 1970s involved something similar with a disease that affected wheat. They found the solution in a Turkish variety, which had been collected by Professor Harlam in the 1940s and had been ignored because of its low levels of productivity and quality. This variety, which nobody set much store by, has been one of the largest donors of resistance, not only to this fungus, but also to other diseases.

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The FAO says that traditional farmers are the guarantors of the world's agricultural diversity [...] which is why the Treaty contains an article about this, and a Universal Declaration of Farmers' Rights is also being negotiated by the UN Human Rights Committee.

This shows the dangers of uniformity, and that we need diversity to find what we are looking for. By the end of the twentieth century this was no longer an option but instead a necessity, because the green revolution led to a major loss of biodiversity. Thousands, or hundreds of thousands, of traditional varieties of the most important crops were replaced by a handful of homogeneous commercial varieties, which were more productive under certain conditions, based on the use of fertilisers, irrigation systems, pesticides and machinery. This increased productivity, but there was a high price to pay. The twentieth century saw the loss of between 70% and 90% of agricultural diversity worldwide. Over 90% of fruit and vegetable varieties were lost in the United States. In India, more than 30,000 varieties of rice were cultivated at the beginning of the twentieth century, while only a dozen are cultivated in 75% of the country today. I myself harvested about 380 varieties of melon in Spain in the late 1960s, but these days you won't find more than a dozen in the markets.

In addition to the problem of genetic erosion, there are political implications, because countries are not self-sufficient.

A country's level of dependence can be calculated by considering whether its main crops originate from outside or inside its borders, because that is where the possible solutions to any needs that arise will come from. Spain's dependence is around 85%, for the United States and Australia it is over 95%, and the average is more than 60%; it falls to 30% only in some countries like Ethiopia, but they are all dependent to some extent. That is why international cooperation is essential, and the issue was discussed at the United Nations in the 1970s. During that decade, the FAO began negotiations that went through various phases, and culminated in the International Treaty on Plant Genetic Resources for Food and Agriculture and the Convention on Biological Diversity, which we will discuss in detail below

What role do local varieties play in the conservation of agricultural biodiversity?

Local varieties are the varieties that farmers have developed and preserved, while adapting to conditions and human tastes and needs in the area over thousands of years.

They carried out a genetic selection when they stored the seeds of the products that they liked most and which suited them the best, and when they planted them for the following year's crop. The circumstances, tastes and needs differed in each area. They adapted to heat, cold, drought and pests and diseases, but also to local cuisine and all kinds of changing conditions. My friend Marc Petrini, a founder of the Slow Food movement, says that they are cultural heritage, comparable to great monuments and other great works of humanity. If this heritage is replaced by a commercial variety that is useful today but may no longer be useful tomorrow, then a part of local identity and knowledge is lost.

The FAO says that traditional farmers are the custodians of the world's agricultural diversity, as they have developed and preserved it for thousands of years, and are passing it on to the present and future generations. For this reason, the International Treaty on Plant Genetic Resources for Food and Agriculture contains a specific article on 'Farmers' Rights' and the UN Human Rights Commission is also negotiating a Universal Declaration on 'Farmers' Rights'.

What can you tell us about biotechnology and bioethics concepts?

There is a trinomial between biodiversity, biotechnology and bioethics, but this latter concept is not usually taught at universities, and it is important.

We have already talked about biodiversity as the raw material for producing new varieties. Biotechnologies as an instrument are the techniques applied to biodiversity to obtain new varieties, and they can be simple or sophisticated, traditional or modern. Biotechnologies in themselves are neither good nor bad. How and why they are used and who uses them may be more or less ethical, more or less harmful to a majority or a minority, and that is where bioethics comes in. As François Rabelais said: 'science without conscience is the ruin of the soul'.

In short, biotechnologies tell us what we can do, and bioethics helps us decide what we must do.

Is it possible to put a price on agricultural biodiversity? What criteria are used when deciding whether to conserve a variety?

Agricultural biodiversity has a huge value, but it is difficult to put a price on it. The market system uses supply and demand to establish prices. It's difficult to say how much demand there will be for a given variety in the future, and what the supply of it will be... We have already seen how a variety of corn, which everybody thought was useless, turned out to be essential for preventing a serious disease... You may be ignoring or underestimating a variety in the present which will be highly valued in the future. It's what market economy experts call a 'system externality'.

One of the challenges of the Rio Summit was: how to internalise externalities in order to protect biodiversity and other natural resources. Calculating the price of a natural resource to ensure that future generations can continue to have it is not an easy task. And the most difficult job is to decide who has to pay for it and how – either the consumer or the producer, by means of a tax or as a charge on the price. And as this is something that each country has to decide, we come up against a problem because those future generations don't consume or vote, and the political and market system doesn't take them into consideration... For this reason, the suggestion was made at the Rio Summit in 1992 that national and regional parliaments should have an advocate for future generations; someone who has studied the impact of the consequences of any bill on the generations to come, and to raise them so that parliamentarians take them into account when they are voting. Intergenerational justice was also discussed... But we're not paying attention to it; when we eliminate biodiversity, we are robbing our grandchildren of the ability to deal with changes that are bound to happen.

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Suggestion made at the Rio Summit in 1992 was that national and regional parliaments should have an advocate for future generations […] Intergenerational justice was also discussed... but we're not paying attention to it; When we eliminate biodiversity, we are robbing our grandchildren of the ability to deal with changes that are bound to come about.

What criteria should be used to select what we do and don't conserve?

Well, if I had to make priorities, they would certainly be the most diverse species and varieties. There are several technical methods for identifying diversity, such as measuring the allele frequency, polymorphisms and heterozygosis.

Figure 3. *A country's level of interdependence can be calculated by considering whether its main crops originate from outside or inside its borders, because that is where the possible solutions to any needs that arise will come from. A local market in India. Source: Santi Álvarez.*

Do you think *in situ* or *ex situ* conservation is better, or do they complement each other? What is conservation on *farm* and why is it important?

All of them are complementary and important, but I would like to add that local knowledge combined with these local varieties is important, and their use and consumption should be encouraged.

Conservation *ex situ* is conservation away from the variety's place of origin, such as in a germplasm bank, botanical garden or an arboretum. Conservation *in situ* protects the area where it takes place, such as a national park, and it is used for wild species in particular. Conservation on *farm* is carried out by farmers for the species grown on their farms.

Conservation *ex situ* in germplasm banks, where seeds are stored at low temperatures and under very controlled conditions, has been carried out for years because it is the most practical alternative for scientists and enhancers, who no longer need to travel the world in search of samples. But it also has some disadvantages, for example, poor management of conservation techniques or a failure in the cooling system can ruin everything. The material also has to be replaced from time to time, and this leads to the loss of the less common alleles. On the other hand, by freezing the seeds, you also freeze their ability to evolve and coadapt in the environment

In short, the ideal thing for me would be *in situ* and on farm biodiversity, but it is not always possible.

What do you think about the conservation of phytogenetic resources in Spain? What role should the autonomous communities have? How do you think that governments could improve the current situation? And what can producers or even consumers and society in general do?

In this case as well, all levels, from international to local, through regional and provincial, must complement each other.

In the 1990s, when the FAO wanted to examine the agricultural diversity existing at that time, and the shortcomings, overlaps and emergency situations, the possibility of forming a small group of experts to consider these issues was discussed, but they realised that a few people could end up imposing their opinions on something that affects a lot of people. Fortunately, the idea of studying it from the bottom up prevailed. So each FAO member country was asked to produce its own 'National State of Genetic Resources' and its own 'National Action Plan'. About 160 of over 180 countries produced their own national documents, and they were used to create regional documents for Africa, North America, Latin America, Europe, the Middle East, etc. The process culminated with a report on the 'State of the World's Plant Genetic Resources' and a 'Global Plan of Action'. Projects and activities are undertaken and financed at the various levels based on that.

What happened at a national level? What happened in Spain? Well, they made the exact mistake that the FAO wanted to avoid. This is what I think is still lacking: producing these reports, but at a local and municipal, regional, autonomous and finally a Spanish level. Some attempts have been made, but not from the bottom up. A comprehensive strategy that includes all actors (consumers, farmers, experts, civil servants, business people) and disciplines (biology, agronomy, environment, health, etc.) also needs to be developed; interregional and interdepartmental committees that work on a coordinated basis to meet the different needs without being subject to political variations and short-term measures need to be created.

As outlined by the FAO? What do you think about the Convention on Biological Diversity and the International Treaty on Plant Genetic Resources?

We have already discussed how up to 90% of cultivated biodiversity has been lost over the last century in some countries, and why international cooperation is no longer an option but a necessity.

For this reason, the United Nations produced the 'International Commitment on Plant Genetic Resources', an ideal but non-binding agreement, in the 1970s. Then came the 'International Treaty on Plant Genetic Resources for Food and Agriculture' and the 'Convention on Biological Diversity', which is broader in scope and also covers animals and uncultivated species; both are binding on all the countries that have ratified them.

But let's talk about the Treaty, since it is specifically about agricultural biodiversity, which is the subject of this Dossier. This document provides a multilateral legal framework. This is important in the field of genetic research on plant species, because an enhancer who works with many varieties in many countries would need to reach bilateral agreements with each one, and this would be expensive and difficult.

There was an obvious need, but the various countries had different approaches and interests, and the negotiations dragged on for years.

What many considered a utopia in the eighties, and even a waste of time in the 1990s, ended up being approved by consensus in 2001 and was defined by the FAO Director General as a historic milestone in North-South relations and one of the organisation's most important achievements.

Figure 4. *Traditional varieties conserved in Era Association Seed bank. Source: Toni Sirera.*

Figure 5. *The conservation of traditional varieties is as important as the conservation of the region's traditional knowledge. In the Terres de l'Ebre region, many olive groves are surrounded by stone walls, known as valones to prevent the wind from uprooting them. Roquetes (Baix Ebre). Source: DARP*

What does it contain? I think there are three main areas: the objectives, the multilateral access and benefit-sharing system, and farmers' rights.

The objectives, explained in article 1, set out in article 1, are: the conservation and sustainable use of plant genetic resources for food and agriculture and the fair and equitable sharing of the benefits arising from their use.

The multilateral access and benefit-sharing system is at the heart of the Treaty, and it was also the most delicate part of the negotiations, and the result is embodied in articles 10 to 13. According to article 10, the seeds of other countries can be accessed subject to a commitment not to claim intellectual property rights over materials for which the decision has been taken to include them in the multilateral system, because they are to be used and enjoyed by humanity as a whole. No payment is to be made if no benefits are obtained from the use of this material or its by-products, but a small percentage ranging from 0.5% to 1.1% is payable if monetary profits are obtained. This sum is to be invested in financing projects, programmes and activities in accordance with the Treaty's objectives in the least developed countries, which are usually those that make the biggest contributions to biodiversity.

Farmers' rights are stipulated in article 9. The Treaty recognises traditional farmers as the custodians of agricultural biodiversity, who have developed it and have made it available to enhancers and scientists, as well as to other farmers. It states that traditional knowledge is necessary to ensure that this work continues, and participation in the benefits and these farmers' right to participate in political decisions, etc. must be promoted.

This Treaty was approved at the FAO in 2001, and it has so far been ratified by the parliaments of around 150 countries, including the United States and Japan, which abstained when it was approved at the FAO. It was ratified unanimously by the Spanish Parliament in June 2004.

The challenge now is to develop legal regulations to implement it. This has happened with some of its provisions, but several aspects have yet to be to addressed, including article 9 on farmers' rights. The role of regional parliaments could be important in this respect. For example, some Italian regions have produced their own implementation mechanisms in the absence of national laws, and opportunities for interpretation and legislation in each case.

What is your position about Nagoya Protocol?

The Nagoya Protocol on access to genetic resources and the fair and equitable sharing of benefits arising from their utilization is a complementary agreement to the Convention on Biological Diversity.

It came into force in 2014 and has been ratified by around a hundred countries, including Spain. However, little progress has been made in the development of regulations for application at the national level.

The Protocol covers all biodiversity and not just cultivated biodiversity; for the latter, it often refers to the International Treaty on Plant Genetic Resources for Food and Agriculture and Food in the case of plants, and to the FAO's Commission on Genetic Resources, which also deals with animal, forest and fish biodiversity that is of interest for human consumption.

What measures should be included in the CAP to prevent the loss of cultivated biodiversity?

My speciality is not the common agricultural policy (CAP), but I believe that it needs to develop more specific mechanisms for the conservation and sustainable use of biodiversity and farmers' rights, as they are essential for the development of some of its cornerstones, such as food security and mitigating the effects of climate change.

Food security still relies heavily on family farming, traditional crops and short cycles; especially in areas with poor economies. Furthermore, these varieties are those that are most able to adapt to climate changes.

For this reason, I believe that the conservation and sustainable use of biodiversity should also be one of the objectives of the CAP, in accordance with the provisions of the Treaty and the Convention. But that isn't the case, or rarely is.

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European agricultural policy could be more integrative in areas such as food - it could be a 'CAFP' (Common Agricultural and Food Policy). Many production and market objectives are being met, but we forget that the basic objective of agriculture is to feed humanity.

Meanwhile, European agricultural policy could be more integrative in areas such as food; it could be a 'CAFP' (Common Agricultural and Food Policy). Many production and market objectives are being met, but we forget that the basic objective of agriculture is to feed humanity. If we gave more consideration to the effects of each type of agriculture on the environment and human health, perhaps we would have another type of agriculture. The European Union is spending huge amounts every year to relieve the environmental damage caused by the current food and agriculture system, and the consequences of a number of illnesses that are the result of poor nutrition. Maybe it would be cheaper to use the CAP to prevent and deal with these problems.

Figure 6. *Agricultural diversity is the necessary buffer for ensuring agriculture's sustainability in an uncertain future, which is dominated by new phenomena such as globalisation and climate change, and in which human needs for the twenty-first century are unpredictable. Rice field in Sulawesi (Indonesia). Source: Santi Álvarez.*

What are the challenges of the future for our agriculture and how can cultivated biodiversity contribute to solving them?

I believe the main challenge is to end hunger in the world. This question is unavoidable in the twenty-first century. Hunger and poverty are breeding grounds for the growth of illegal immigration, international violence and the great pandemics of humanity. Globalisation means one country's crisis affects others. This is the main difference between the fight against hunger in the past and today.

The 2008 food crisis is an example of this. The prices of basic foodstuffs in the international market doubled or tripled in a few months as a result of many things, including speculation in the Chicago futures market. This led to revolts in the street in more than 70 countries, and some governments fell.

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About four or five years ago, the FAO carried out a very interesting study to measure the source of the food that we consume, what feeds us, not what it is produced and gets lost on the way. This led to a big surprise: 75% of the products that reached consumers come from family farming and small farmers!

So far, solving the problem of hunger in the world has been a humanitarian and charity issue, but now it can also be considered a matter of intelligent selfishness. Rather than being a disgrace, hunger is a threat. In my opinion, without food security, there can be no world peace or security.

The other big challenge is the environment. It is not a question of ending hunger now and at any price. We cannot produce food by destroying the planet's natural resources (water, air, land, biological biodiversity and energy) because our children will need them. The world has grown smaller, and we are now aware that natural resources are perishable and limited. Agriculture needs them to transform them into food, using either traditional or modern technologies. Destroying these production resources all over the world means mortgaging the future and condemning future generations to hunger.

Unfortunately, this is what is happening at the moment, without even meeting our objectives... According to the FAO, we produce 60% more food than we would need to feed humanity, while 800 million people go hungry and 17 million die each year (40,000 a day) as a result of hunger and malnutrition.

At the same time, 1.3 billion metric tons of food (one-third of world agricultural production) are lost or squandered, and a large proportion ends up in landfills. The figure for Europe is more than 80 million metric tonnes per year, and for Spain it is 7.7 million metric tonnes, or in other words, 169 kilograms per inhabitant per year. Ending hunger is not only a matter of production, but also of access to food.

As for the environment, the production of these 1,300 million metric tonnes of food that are not consumed involves the use of 1,400 million hectares, an area 28 times the size of Spain, more than 250 cubic kilometres of water (a quarter of the fresh water used on the planet) and 300 million barrels of oil. If that wasn't enough, it has also been calculated that the average item of food in Spain reaches our mouth after travelling 2,500 kilometres.

These outrageous figures show that the main objective of production today is not to feed people, but to sell it and other financial benefits. This issue is aggravated even further by the increasing concentration of the seed and agrochemicals business in just a few hands. Mergers have taken place between Monsanto and Bayer, Dow and Dupont and ChemChina and Syngenta in recent years. These three large groups account for at least 70% of the world seed trade, and 65% of international agrochemical production.

That is without considering the issue of land grabbing or the appropriation of fertile land in poor countries to take advantage of lower costs, such as labour costs, and producing foods that do not feed the local population but are taken to other countries... in short, an oli-

gopoly that commodifies food production, and depersonalises it...

This used to be justified by the argument that producing large quantities in large areas is good because it increases productivity. Some people questioned this argument, but they had no obvious figures to back them up... So about four or five years ago, the FAO carried out a very interesting study to measure the source of the food that we consume, what feeds us, not what it is produced and gets lost on the way. This led to a big surprise: 75% of the products that reached consumers come from family farming and small farmers! That is why 2014 was declared the International Year of Family Farming, which is the farming that provides most food for the world.

We were talking earlier about the hunger caused by the crisis of 2008. In countries like Benin and others in East Africa, it became clear how dangerous it is to dismantle traditional agricultural systems and to lose food sovereignty, or in other words, a people's ability to feed themselves. A dependence on food from the international market involves a loss of political sovereignty.

What is the role of biodiversity and what type of crop sustains this type of family farming? Are the most important crops the ones we know about? Not necessarily. They are different crops in each region. Remember that as we said at the beginning, humanity has used between 7,000 and 10,000 different species of plant in its diet.

As an example, I will give you some traditional Andean crops, which perhaps we have never heard of here but which have been grown for thousands of years: quinoa, oca, cassava, canihua, olluco, mashua, arracacha ... these underused crops, otherwise known as poor man's crops, have enormous potential to improve their productivity with minimal investment, and may be crucial in dealing with the climate changes of the future...

In 2013, the FAO wanted to draw attention to these marginalised crops, and declared the International Year of Quinoa. Quinoa was the main crop in the Andean region before the Europeans arrived – the equivalent of wheat for us, and it was even used in religious rituals, in the same way as bread is used here.

Figure 7. *According to the FAO, we produce 60% more food than we would need to feed humanity, while 800 million people go hungry and 17 million die each year (40,000 a day) as a result of hunger and malnutrition. Source: Santi Álvarez.*

The encounter between the two civilisations led to everything that was considered heresy being prohibited, including the cultivation of quinoa. The fields were burned, and those who grew it were imprisoned or sentenced to death. Meanwhile, European crops including wheat were cultivated, but after adapting to American conditions, they do not reach the same levels of production. Today, wheat grown there produces around 500 kilograms per hectare, while in Spain, Italy or France it provides about 5,000 kilos per hectare. Now you have the ridiculous situation in which poor people are asking for bread to eat and at the same time, wheat is being imported and bread is being subsidised for sale... However, the FAO proclaimed 2013 as the International Year of Quinoa, which contains 20% more protein than wheat, more essential amino acids, iron, calcium and is also gluten free... and in a short time, it made the transition from being a forgotten food, that could have been lost forever, to a superfood...

Another example is oca *(Oxalis tuberosa)* which is cultivated in highlands in the Andean region, at altitudes of 3,000-3,500 metres. It is an crop for exchange and subsistence, but it is essential for about 9 million people. Some years ago, Rolando Estrada, who at that time was a student and who is today a lecturer at the University of San Marcos in Lima, used the $10,000 grant for his doctoral thesis to study this crop. He discovered that the low productivity levels of these tubers was due to a congenital virus, and that production could be tripled in plants that did not have this problem. He could have patented and sold plants free of the virus, but he did something much more worthwhile: he presented his discovery to the farmers and asked them to send him their variety, he cleaned them up one by one and he returned them, thereby preserving their intravariability.

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Underused traditional crops such as quinoa, oca and cassava, etc., otherwise known as poor man's crops, have enormous potential to improve their productivity with minimal investment, and may be crucial in dealing with the climate changes of the future.

This story is an example how several things are important: the use and development of appropriate technologies for traditional crops, modest investments to improve the lives of local populations, and public research that addresses issues that are not of interest to the market.

This is associated with what we were talking about earlier: protecting local species and varieties is very important precisely because their value is incalculable. Some reports warn us that within a few generations, it will be impossible to cultivate olives or vines in Spain; if these warnings are correct, perhaps we will have to resort to these neglected or underused crops.

Finally, agricultural diversity is the necessary buffer for ensuring agriculture's sustainability in an uncertain future, which is dominated by new phenomena such as globalisation and climate change, and in which human needs for the twenty-first century are unpredictable. Maintaining and using diversity means keeping our options open, and rejecting the conceit of single models

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THE CULTIVATED BIODIVERSITY ACTION PLAN OF CATALONIA

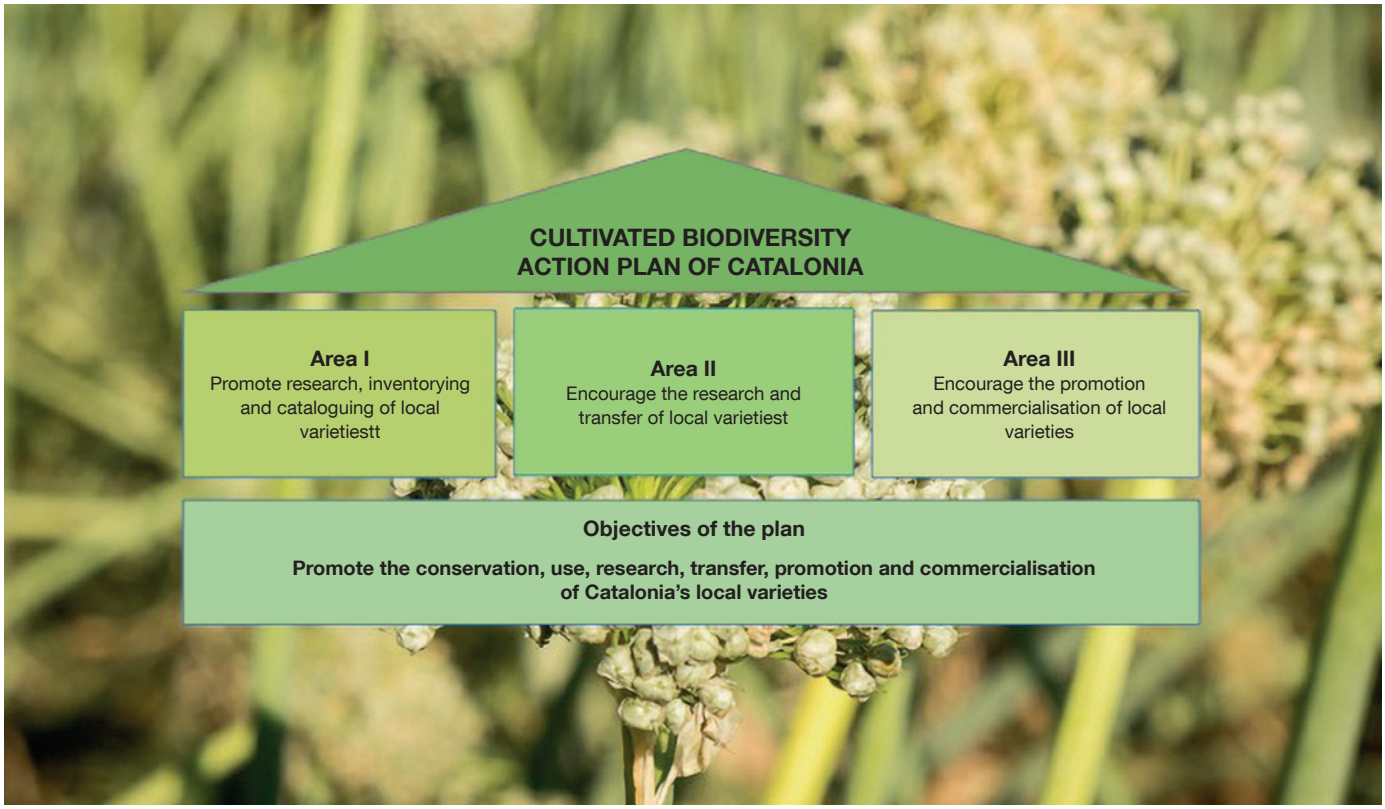

Figure 1: *Cultivated biodiversity action plan of Catalonia. Source: DARP.*

01 Introduction

Given the need to preserve the biological and genetic diversity of agriculture, the Ministry of Agriculture, Livestock, Fisheries and Food of Catalonia (DARP) has taken various measures to promote and conserve endangered phytogenetic resources in Catalonia.

In 2012, the DARP produced the Cultivated biodiversity action plan of Catalonia in order to foster the conservation, use, dissemination and commercialisation of Catalonia's local varieties.

A new five-year plan is currently being produced with the agricultural sector, to meet the new needs and concerns of the various actors involved in the conservation and use of local varieties and of cultivated biodiversity.

One of the main objectives of the Action Plan is to support and harmonise the work that the various conservation organisations have been carrying out, and at the same time, to contribute to the dissemination and consumption of local varieties from Catalonia, to ensure they are used for sustainable agriculture linked to the territory. By doing so, it will be possible to ensure that farmers continue to conserve this material in the field.

The new Action Plan will include the various actions in three areas:

- Area I: Promote research, inventorying and cataloguing of local varieties.

- Area II: Encourage the research and transfer of local varieties.

- Area III: Encourage the promotion and commercialisation of local varieties.

Most of the work done has initially focused on identifying and characterising Catalonia's local varieties, in order to collect and preserve them.

The Action Plan includes the measures undertaken by the DARP, by other government bodies, by the Institute of Food and Agriculture Research and Technology (IRTA), by the Catalan Institute of Vines and Wines (INCAVI), by the Forest Sciences and Technology Centre of Catalonia (CTFC) and the various conservation organisations.

The most important measures in the Action Plan for Cultivated Biodiversity are listed below

02 The Local Varieties of agricultural interest of Catalonia

In 2012, the Catalogue of local varieties of agricultural interest of Catalonia was created by Decree 131/2012, the 23 October, which regulates the Official Register of Companies Supplying Plant Material and stipulates the regulations governing authorisation, registration and operations, as well as the activities involved in the production and commercialisation of plant material.

The Catalogue aims to guarantee and protect Catalonia's native plant genetic heritage and to establish the measures necessary for the conservation, characterisation, collection and use of the phytogenetic resources in Catalonia's agricultural sector.

The varieties, populations and ecotypes of agricultural interest for Catalonia are registered in the Catalogue. If a variety must be registered, information about a minimum number of its morphological descriptors must be provided, as well as the ethnobotanical, organoleptic and agronomic information available for identification.

The varieties that are included in the Catalogue are mainly described and characterised by public and private institutions in Catalonia working on the research and conservation of phytogenetic resources, which carry out technical trials in order to collect as much information as possible.

The Catalogue of local varieties currently contains 66 local varieties of horticultural, fruit and vine species, among others and estimates suggest that around 400 varieties will be registered over the next five years. The Catalogue of local varieties of agricultural interest of Catalonia can be accessed on the DARP website (http://agricultura.gencat.cat/ca/ambits/agricultura/dar_biodiversitat_cultivada/dar_cataleg_de_varietats_locals)

03 The Local Varieties Agricultural Commission

The Local Varieties Commission was created by Decree 131/2012 of 23 October, and constituted in June 2013. The Commission is the advisory body of the DARP, and is made up of representatives of the directorates general responsible for agriculture and rural innovation, a representative of the directorate general responsible for the environment, which is currently the Ministry of Territory and Sustainability, two representatives of professional agricultural organisations, two representatives of the organisations carrying out local conservation and recovery tasks, a representative of the IRTA, one from the INCAVI and one from the CTFC, and by a person specialising in genetic research on herbaceous, tree and forest plants of agricultural interest.

Its functions are to:

- Establish the protocols for the cataloguing and registration of local agricultural varieties of Catalonia for which there are no official questionnaires from the Community Plant Variety Office (CPVO) or the International Union for the Protection of New Varieties of Plants (UPOV) or descriptors from Biodiversity International.

- Examine and assess applications for registration of local varieties in the Catalogue of local agricultural varieties of Catalonia.

- At the request of the Directorate General for Agriculture responsible, issue a report on applications for registration for conservation varieties in Catalonia and the horticultural varieties developed for cultivation under certain conditions.

- Participate in defining proposals and development measures for the conservation and sustainable use of cultivated biodiversity in Catalonia.

- Propose measures to raise public awareness of the conservation and sustainable use of local agricultural varieties in Catalonia.

- Act as an advisory body on the conservation of local plant species of agronomic interest in Catalonia.

Commission creation is a pioneering initiative in Spain in this field.

→

The DARP is committed to local varieties and to their conservation.

Conservation is expensive, but failing to do so may be even more so (J. Esquinas, 2009).

04 The Seed Bank

2015 was the starting point for the creation of the Seed Bank of Catalonia.

The objective of this Seed Bank is to preserve and conserve local varieties of agricultural interest in Catalonia, thereby helping to prevent the loss of phytogenetic resources that are vitally important for the sustainability of agriculture and nutrition in the present and the future. The purpose of the Bank is to conserve the seeds of local varieties registered in the Catalogue of local varieties of agricultural interest, and seeds donated by individuals, institutions and organisations that would like them to be preserved. In this latter case, the DARP may present the variety to the Local Varieties Agricultural Commission for their possible characterisation and subsequent registration in the Catalogue. The Bank aims to be the reservoir for safeguarding Catalonia's local varieties, which are at the same time preserved in the seed banks of the various conservation organisations.

Figure 2. *The varieties shown in the image are (from left to right and from top to bottom): "del queixal" corn (undergoing registration), avellaneta rossa bean (undergoing registration), black corn (undergoing registration), ull ros bean (registration number in the catalogue: CAT041CVL) and white corn (undergoing registration). Source: DARP.*

Figure 3. *"Tia Maria" corn variety is undergoing registration in the Catalogue of local varieties of Catalonia presented by Les Refardes (Association). Source: Ester Casas.*

Figure 4. ***"****Tardà de Riells" tomato is registered in the Catalogue as number CAT033CVL and was presented by "Consell Comarcal del Vallès Oriental". Source: Toni Sirera.*

Figure 5. *"Campeny morada" onion, a variety registered in the Catalogue of local varieties as CAT013CVL, presentedby "Consell Comarcal del Vallès Oriental". Source: Jordi Puig.*

Figure 6. *"Morro de llebre" apple, a traditional variety registered in the Catalogue of local varieties as number CAT038CVL, submitted by "Consell Comarcal Pallars Sobirà". Source: Consell Comarcal Pallars Sobirà.*

The Bank is physically located in Lleida, at the DARP Seed Laboratory, and is a pioneering initiative within the Catalan Government

Work is currently being done on the regulatory text that will govern the creation, functions and facilities of the Seed Bank for inclusion in an amendment to Decree 131/2012 of 23 October.

05 **Promotion of cultivated biodiversity through the Rural Development Programme of Catalonia (RDP)**

According to the objectives of the Cultivated Biodiversity Action Plan, the DARP has established a five-year line of funding within the RDP (2015- 2020) aimed at conservation organisations. The subsidised measures are aimed at supporting the maintenance of in situ and ex situ conservation of the traditional varieties undertaken by conservation associations in their own seed banks, as well as characterising and describing the varieties for registration in the Catalogue, collecting information on genetic resources, creating inventories and databases that can be consulted online, and carrying out informative and outreach activities related to cultivated biodiversity for producers and consumers.

There are currently 12 organisations which benefit from this funding for cultivated biodiversity, which are making major efforts to produce the Catalogue of local varieties of agricultural interest of Catalonia and to engage in conserving and disseminating all this material.

The new Action Plan will include the actions to be taken into account in view of the possible new measures to be included in the next Rural Development Programme after 2020.

06 **Commercialisation of local varieties**

Local varieties have a high level of genetic and phenotypic variability, which favours their adaptation to their environment, which in turn makes it difficult for them to meet the requirements for registration in commercial registers, basically in terms of their homogeneity.
According to Law 30/2006, of July 26, concerning seeds, nursery plants and phytogenetic resources, only varieties registered in the Spanish Register of Commercial Varieties (RCV) and/or in the Common Catalogue of Varieties of the Euro-

Figure 7. *Technical seminar of the PATT on local tomato varieties in Bages region. This took place on 24 July, 2017 at Món Sant Benet on Sant Fruitós de Bages, and was organised by the Manresa Agricultural School in partnership with the L'Era, Espai de recurs agroecològics, the Alícia Foundation and Bages Regional Council. Source: Toni Sirera.*

Figure 8. *Eighth edition of the 'Lliga't a la terra', agricultural fair in Santa Eulàlia de Ronçana (2017). Source: El Vallès Oriental Regional Council.*

Figure 9. *Participatory selection project of organically farmed lettuce in Benifallet. Source: Fundació Miquel Agustí.*

pean Union or of the Organization for Economic Cooperation and Development (OECD) can be brought to market.

Inclusion in these registers is subject to passing technical identification tests to confirm that the material from the variety submitted is distinct, stable, homogeneous and in some cases of agronomic value, in comparison with the other varieties in the reference collection.

Based on the conditions above, and considering the importance of being able to market local varieties in terms of their conservation and sustainable use, the European Commission adopted Directives 2008/62/EC of 20 June 2009 and 145/EC of 26 November, establishing some exemptions for local varieties at risk of genetic erosion for inclusion in the national catalogues of varieties and for their commercialisation.

The majority of the local varieties of agricultural and horticultural species can at present be registered in the RCV as varieties for conservation or as horticultural varieties developed for cultivation under certain conditions, and most fruit species as varieties without intrinsic value or as varieties with an officially recognised description (ORD), with less stringent requirements in all cases.

The aim of DARP is to register ex officio all the varieties of the Catalogue of local varieties of agricultural interest of Catalonia in the Spanish RCV, either as a variety for conservation, as a variety without intrinsic value or as a variety with an officially recognised description (ORD) as appropriate, and thereby enable their commercialisation.

07 Research and transfer

In addition to promoting the conservation of Catalonia's local varieties, it is also important to foster their improvement and encourage research to meet producers' needs, and to have diverse genetic material that is resistant to diseases and adapted to specific soil and climate conditions, and to the conditions of organic production.

As part of the Programme to promote food and agriculture production, the DARP has established a support mechanism to encourage applied research in the field of organic production, which subsidises projects working on the selection and improvement of varieties for organic production, and local varieties in particular. Projects that take into account the sector's needs and participation are considered in a particularly positive light when these grants for research centres and universities are awarded.

Research and knowledge transfer are crucial for raising awareness of the local varieties of among producers and actors working in cultivated biodiversity. The annual technology transfer plan (ATTP) is the DARP tool that contains, schedules and coordinates research and technology transfer and knowledge transfer activities, including those related to cultivated biodiversity. The participation and collaboration of administrations, research centres, universities, foundations, consortia, producers' organisations, professional organisations, companies and other agents in the sector are essential for its implementation.

The DARP also has two areas of support that promote innovation in the framework of the Rural Development Program 2014-2020 for Catalonia: support for cooperation for innovation (creation and operation of operational groups) and support for demonstration activities (technology transfer). The former provide incentives for the consideration and drafting of innovation projects and the undertaking of innovative pilot projects, and the latter are aimed at supporting the transfer of technical and management knowledge adapted to territorial and sectoral conditions in the field of cultivated biodiversity, among others.

08 For additional information

DARP cultivated biodiversity website:
http://agricultura.gencat.cat/ca/ambits/agricultura/dar_biodiversitat_cultivada/dar_cataleg_de_varietats_locals.

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ORGANISATIONS AND ASSOCIATIONS AS A FORCE FOR CHANGE

01 Introduction

The long-standing work that has been done by the associations and organisations that have collected, studied and stored our ancestors' seeds and plants all over Catalonia calls for recognition.

Today, more than twenty organisations are working to conserve this heritage, in the areas of research, recovery, promotion, and/or conservation of traditional varieties, either through conservation ex situ, in germplasm banks, or in situ, by cultivating traditional kitchen gardens that provide food for private use and markets.

This article lists the organisations we are aware of that are working on the recovery of local and traditional varieties, although it is by no means an exhaustive list.

Figure 1. *The horticulturists of Puig de la Bauma in Mura are an example of the* in situ *conservation of cultivated biodiversity. Les Refardes. Source: Toni Sirera.*

There are various organisations in Catalonia today interested in the conservation of this heritage. Some of them were established with this in mind, and others work within a broader scope. However, they all have a common goal: to conserve cultivated biodiversity.

To facilitate consultation of the information, the different initiatives carried out in the country have been grouped into the following areas:

- Networks of stores,
- Other seed banks and collections of living plants,
- Protected areas,
- Universities and research centres,
- Regional councils and other local institutions,
- The production sector, and
- Plant material production associations.

02 Conservation organisations

Numerous organisations are working to conserve cultivated biodiversity; there are different experiences in each region that are the result of local initiatives.

These dispersed initiatives have been the response in each region, with different types of organisation: involving farmers, associations and consortia, among others.

02.01 Xarxa catalana de Graners

The forerunners of Xarxa catalana de Graners, (seed local Association) established in 2004, were the Local Self-Managed Seed Banks. Their coordination led to the establishment of today's network. Its members work on an independent but coordinated basis, with the added advantage of sharing information and helping each other, as they work as a network. There are networks all over Spain, and they are all coordinated in the Seeds Network.

The main objectives of the Xarxa catalana de Graners are:

- Coordinate the various banks in the Network,
- Exchange and supply themselves with seeds,
- Facilitate self-training and the exchange of knowledge,
- Support the creation of new stores,
- Raise awareness of the importance of local varieties,
- Share a common database and website,
- Support and coordinate with other related projects,
- Produce characterisation records for the different varieties, and
- Coordinate research on traditional varieties and their associated culture.

The Network has a number of characteristics in order to meet these operational objectives:

- Its own store: each group has its own physical space to store the seeds collected in its area and is responsible for their reproduction, preservation and exchange.
- Organic farming: in all its varieties, to ensure the highest quality. No organic certification is required.
- Surveying: to obtain local varieties and information related to their area.
- Codification of the Network's database: to follow the unified criteria of all the banks. This improves the exchange of information between all the groups.
- Participate in the assemblies and coordinate with the Network

"Xarxa de Graners" members

ECOLLAVORS

E-mail: ecollavors@gmail.com

This group consists of more than twenty farmers in the La Garrotxa region.

They recover, conserve and reproduce the local and traditional horticultural varieties, and others that are considered useful to meet the needs of their own kitchen gardens.

They organise and raise awareness of studies, work and methods for the conservation and improvement of local and traditional plant and phytogenetic resources using organic farming

TRITICATUM

E-mail: triticatum@gmail.com

This organisation works on the conservation, reproduction, study and research of wheat in the project "Jardí Bressol de Blats" in the region of La Garrotxa. It is involved in awareness-raising and training for farmers and bakers through exhibitions and presentations.

One of its areas of work is a small workshop with two stone mills for research and testing of the varieties from the project "Jardí Bressol de Blats" and from other sources to deliver to producers subject to prior agreement.

ERA, ESPAI DE RECURSOS AGROECOLÒGICS (ASSOCIATION)

E-mail: esporus@associaciolera.org
http://www.esporus.org

In 2002 this group launched the Esporus Cultivated Biodiversity Conservation Centre project, in the Bages region, in order to collect local varieties from all over Catalonia, both from extensive and horticultural crops. It now has more than 370 varieties that they reproduce, study, conserve and disseminate with the help of volunteers and members of the farming community. They also carry out surveys in natural parks and regions of Catalonia, and organise technical seminars and tastings.

LES REFARDES

E-mail: lesrefardes@gmail.com
http://www.lesrefardes.com/

The main objective of Les Refardes is to involve farmers, vegetable garden enthusiasts and consumers in the continuation of a cultural and agricultural landscape that has been created over the last 10,000 years.

The initiative began in the Bages region over 10 years ago, and the group currently consists of 18 seed producers located all over Catalonia.

This group of certified organic production farms is coordinated to sell seeds of local vegetable garden varieties in formats for amateur and professional growers.

The campaign includes almost 200 local varieties that have been provided by the farmers who have stored them, after being selected over generations, together with valuable agricultural and agronomic information

ARBORECO

E-mail: info@arboreco.net
http://www.arboreco.net

This group has worked to recover, conserve and reproduce traditional varieties of fruit trees and wild fruits in the Baix Empordà area for more than 10 years.

They have a collection of more than 150 old varieties including apple trees, pear trees, apricot trees, cherry trees, peach trees, plum trees, pomegranate trees and fig trees.

Most are local varieties that used to be grown in different parts of Catalonia, and others can be found all over Europe.

They provide training and advice for fruit tree plantations, for both individuals and small producers, based on the criteria of organic farming.

LLAVORS ORIENTALS (1 LÍNIA)

E-mail: carbassaviolinera@llavorsorientals.cat
http://www.llavorsorientals.cat/

A conservation organisation covering the natural areas in the Vallès region.

It works to promote, recover and disseminate the local varieties from this area, and tomatoes and pulses in particular. It has recently expanded its area of work to winter varieties. It was established 12 years ago, based on the previous experience of various horticulturalists and people linked to conservation, such as Pep Salsetes and Etern Verdaguer.

The organisation works with various projects including the 'Lliga't a la terra' [Link up with the land] fair, where more than 30,000 tomatoes of local varieties were distributed last year, the Tomatoes Fair and the Vallès Oriental seed bank.

It carries out numerous research and awareness-raising activities for more than 110 varieties of vegetable garden crops in the Vallès region.

CULTURES TROBADES

E-mail: trobades.slowlleida@gmail.com
http://www.culturestrobades.cat

This initiative was launched in 2008 to safeguard the farming biodiversity of the Ponent region in western Catalonia, and to highlight the shared legacy of its seeds, which they consider an authentic and unrepeatable treasure that must be defended from neglect to provide food for the future.

The group works to keep old varieties and strains alive, with a methodology that combines research, conservation and promotion and dissemination of this heritage. They work with seeds of vegetable garden varieties, fruit trees, vineyards, olive trees and cereals and even a breed of goat in the Montsec mountains (the Catalan goat).

LA PANOTXA, ASSOCIACIÓ PEL FOMENT DE L'AGROECOLOGIA

E-mail: hortlapanotxa@gmail.com
www.lapanotxa.wix.com/lapanotxa

This project was created in order to promote agrobiodiversity in the Vallès Central region. They carry out surveys, seeking farmers who still keep seeds, and attempt to get the maximum information on how to handle each plant.

They cultivate and catalogue them, and store a copy of them which they reproduce and offer to anyone interested. They engage in awareness-raising initiatives and work with other agro-ecological projects that are also working to recover local varieties

BANK DE LLAVORS RODA DE TER (SEED BANK)

E-mail: bancllavorsroda@gmail.com
https://bancdellavorsderodadeter.wordpress.com
https://www.facebook.com/bancdellavorsrodadeter

The Roda de Ter seed bank is the first seed bank in Osona, a non-profit association formed by volunteers committed to protecting the biodiversity of local species, and particularly those traditionally cultivated outside large-scale commercial circuits.

Its objectives include:
- Store seeds produced by local farmers.
- Research and cataloguing, reproduction, exchange and dissemination, etc.

This organisation has a plot in the urban orchards of Roda de Ter, where they sow some of the seeds.

ECOMERCADERET

E-mail: ecomercaderet@gmail.com
http://www.facebook.com/ecomercaderet

This bank of seeds and seedlings for the conservation of traditional varieties is based in Santa Margarida de Montbui. They work to recover ethnobotanical heritage and promote sustainable and local agriculture.

Their main objectives are to recover traditional knowledge and survey the agricultural varieties and wild species traditionally used in the Anoia region

LA CASETA

http://producteslacaseta.blogspot.com.es/

cosetes de la caseta

This project recovers old varieties that have almost disappeared, especially tomatoes, and varieties originating in other countries.

Preparation of preserves. They have their own collection of seeds and seedbed.

BANK DE LLAVORS DE COLLSEROLA (SEED BANK)

E-mail: masiacalmando@gmail.com
https://www.facebook.com/pitesigranes/

The Bank is a private collection connected to the Catalan stores network and to other local farmers. It works with Collserola Park to conserve the varieties typical of the mountain range, and they have achieved their objectives with Collserola mandó tomato. They also breed native breeds of poultry, and investigate extinct breeds and varieties and carry out surveys in the local area.

COL·LECTIU EIXARCOLANT

E-mail: info@eixarcolant.cat
http://www.eixarcolant.cat

Col·lectiu Eixarcolant

This association works to promote the recovery of the uses of wild plants, and to determine their potential for cultivation within a highly sustainable agroecological model that is resilient to climate change. They aim to recover traditional knowledge related to biodiversity, and adapt it to today's agronomic and socio-economic situation.

They have a seed bank with more than a hundred wild species with cultivation potential, which they use to carry out various cultivation and exploitation studies.

02.02 Other seed banks and collections of living plants

In addition to the stores network, there are other associations and live plant collections all over Catalonia, which also contribute to the preservation of phytogenetic resources. Some of them are listed below.

ASSOCIACIÓ AGROCULTURAL AMICS DE L'OBSERVATORI DE VARIETATS RIBAGORÇANES (ASSOCIATION)

E-mail: ribagorsanes@gmail.com
http://www.ribagorsanes.com

ribagorSanes

The Association works on the characterisation, research and dissemination of the collection of Llesp apples and pears, which it began in 2009. In addition to the forty apple and fifty pear varieties collected in the Ribagorça Romànica region, there are thirty varieties of modern apples resistant to scabs, which are of interest for the cultivation of organic table apples; the association also studies and promotes the decrease and reduction of agriculture's carbon footprint.

BANK DE LLAVORS DE LA GARROTXA (SEED BANK)

E-mail: sigma@consorcisigma.org
http://www.consorcisigma.org/serveis/banc-de-llavors-garrotxa/

consorci de medi ambient i salut pública
sigma

In 2002, the La Garrotxa Regional Council and Olot Municipal Council created the La Garrotxa Public Health and Environment Consortium (SIGMA) for management of the environment and public health of the town of Olot and the La Garrotxa region.

In 2005, within the formal structure of SIGMA, the La Garrotxa seed bank was established with the aim of preserving historical values, in terms of both the lifestyle and landscape, by recovering and safeguarding old plant species that had been cultivated and adapted to our environment.

The La Garrotxa seed bank recovers and characterises old plant varieties, as a source of a cultivated biodiversity of incalculable value. It keeps the material in good condition ex situ, according to the regulations of gene banks, and undertakes dynamic tracking and promotion of these varieties and their by-products.

It also preserves unusual or endangered wild flora in Catalonia.

BANK DE LLAVORS DEL VALLÈS ORIENTAL (SEED BANK)

www.museuciencies.cat/visitans/jardi-botanic/

The Seed Bank is a project set up by a group of organisations that work to preserve and highlight the value of the region's cultivated agro-biodiversity. The organisations that work together on the project are: the La Tela Natural Science Museum de Granollers (the headquarters of the Seed Bank), the Local Development Department of El Vallès Oriental Regional Council, the Department of the Environment of Granollers Municipal Council, the Public Works Department of Santa Eulàlia de Ronçana Municipal Council, the Llavors Orientals Association and Magrana Vallesana.

Objectives:
- Research and characterisation.
- Registration in the Catalogue of local varieties.
- Reproduction and dissemination.
- Systematisation of the recovery process of these varieties, examination of their economic and commercial potential and positioning them as a distinguishing factor in the food and agriculture sector of the Vallès Oriental region.

The Vallès Oriental Seed Bank currently has 110 local varieties identified in its database, of which around thirty are available for seed exchanges.

JARDÍ BOTÀNIC DE BARCELONA (BOTANICAL GARDEN)

www.museuciencies.cat/visitans/jardi-botanic/

The Garden has an area where local varieties of vegetables are stored, cultivated and reproduced in order to pass them on to those interested.

The members of the Association of Friends of the Botanical Garden participate in the extraction, cleaning and preparation of the seeds to be passed on.

EL POMARI DE L'EMILI

E-mail: albert.soms@hotmail.com
https://elpomaridelemili.blogspot.com

In the past, apple trees in the valley of Arbúcies were cultivated around swath fields. Today, this traditional system of cultivation has disappeared.

Emili Soms, a retired farmer, has been working to recover these varieties. Today, he has more than 40 types in his apple orchard, or *pomari*, including the following apple varieties: *rabada, quadres, ties, camosa* and *sang de llebre*.

ASSOCIACIÓ CENTRE DE CONSERVACIÓ DE PLANTES AROMÀTIQUES I MEDICINALS DE L'ALT PIRINEU (ASSOCIATION)

E-mail: info@ccpam.cat
http://www.ccpam.cat

This association, located in the Alt Pirineu region, works with local aromatic plants that have been neglected or are in danger of extinction due to excessive and incorrect collection.

The Association recovers them and conserves the recovered seeds. They also create plantations with the recovered seeds in order to maintain them. This work is complemented by the recovery and dissemination of the ethnobotanical memory of the Alt Pirineu.

ASSOCIACIÓ TERRITORI DEL SÈNIA (ASSOCIATION)

Jaume Antich Balada (President)
E-mail: asesor@tauladelsenia.org

The Sénia Territorial Association is a joint venture, in which the Taula del Sénia Association of Muncipalities has a 50% share and the other 50% is held by economic and social actors in the area working to promote the region.

Its most outstanding project is the 'Oli Farga Mil·lenària' Quality Guarantee Mark: In 10 years, the number of presses has increased from 1 to 10, and oil production from 300 to 7,900 litres. This is all certified by a specialist company and by testing, and tasting panels recognised by the International Olive Council. Four of these presses are Catalan (Molí de la Creu, Acomont, Montebre and Coop. Godall). Everything has been covered by this Quality Guarantee Mark for the last 2 years. Some farms have recently recovered abandoned ancient olive trees

CONSORCI DE GALLECS (ASSOCIATION)

http://www.espairuralgallecs.cat

The Gallecs Area of Natural Interest Park Consortium is the body managing a protected agricultural area of 734 hectare, and involves six municipalities: Mollet del Vallès, Santa Perpètua de Mogoda, Palau-solità i Plegamans, Parets del Vallès, Lliçà de Vall and Montcada i Reixac, as well as the Ministry of Territory and Sustainability and Incasol. This area, typical of the Vallès plain, is covered by the Plan for Areas of Natural Interest (PEIN), due to its vulnerability and fragility.

Agriculture is the main activity in the area. One of the main areas of work has been to promote cultivated biodiversity, making the transition from a monoculture of cereals in 2004 to the cultivation of more than 34 local and traditional varieties today. Extensive dryland farming crops predominate. The crops grown include varieties of wheat such as *xeixa*, *forment*, *espelta petita*, *espelta bessona*, *blat Montcada* and *blat del cor*, from which flour, bread, biscuits, pastries and other products are obtained, as well as the 'Toc d'espelta' craft beer.

Meanwhile, one of the main areas of agrobiodiversity in Gallecs are legumes, which are represented mainly by menut chickpeas, pardina lentils, various types of beans (*ganxet, genoll de Crist, neu, carall, aigua dolça* and *tendra llaminera* varieties) and *floreta* peas.

There are also fresh and seasonal vegetables, including several varieties of tomatoes (the *pometa*, the *rosa ple*, the *tardà de 3 caires*, the *poma ple* and the *cor de bou*). Varieties of leek, cabbage and broccoli are grown in the winter garden, as well as some winter blooming varieties such as endive and the famous Catalan or butterhead lettuce.

The surpluses from this garden are used to make jam and preserves in the Gallecs workshop, so that no food goes to waste. All these organic and Km 0 products are marketed with the label showing that they are *Gallecs organic locally sourced products*.

Educational activities are also carried out in schools and for the general public to raise public awareness.

02.03 Protected areas

02.03.01 Natural Parks managed by the Ministry of Territory and Sustainability

The plants cultivated are part of the biodiversity of the natural heritage of a protected natural area. The Protected Natural Areas Service of the General Directorate for Environmental and Natural Policy (Ministry of Territory and Sustainability) is involved in work that is taking place in some natural parks to recover this biodiversity.

The main objectives of this line of work are:

- To carry out research on traditional varieties to prevent their disappearance.
- To contribute to the conservation of traditional varieties of cultivated plants.
- To improve agrobiological knowledge of these varieties (adaptation to the environment, vulnerability to pests and disease, productivity, etc.).
- To obtain practical experience in organic fruit growing.
- To promote such farming on collaborating estates as a better conservation system.
- To promote the use of organic farming in the context of a protected natural environment.
- To provide specialised study centres with the opportunity to work in a field of applied research.
- To publicise the use and potential of these varieties and involve different social agents in their conservation.
- To evaluate the commercial potential of recovered varieties.

Some of the most important initiatives carried out in some of the natural parks that work on the conservation of cultivated biodiversity are described in the panels below.

PARC NATURAL DELS AIGUAMOLLS DE L'EMPORDÀ (NATURAL PARK)

E-mail: opalou@gencat.cat
http://parcsnaturals.gencat.cat/ca/aiguamolls-emporda

Traditional varieties:
Reproduction of the Florence Aurora wheat variety, which is around 70 years old and was no longer of commercial interest. It is used (cultivated in integrated production) to create a commercial product (Tramuntana bread).

Recovery for commercial use of traditional and ancient varieties of tomato (including the tres caires tardà de Riells, esquena verd, poma ple, rosa ple gros and corn de nou or pebroter varieties), using organic agricultural production techniques.

Organisations the Park works with on traditional varieties:
- The Castelló d'Empúries Cooperative.
- Esporus.
- IRTA Mas Badia.
- Vessana

PARC NATURAL DEL MONTGRÍ, LES ILLES MEDES I EL BAIX TER (NATURAL PARK)

E-mail: opalou@gencat.cat
http://parcsnaturals.gencat.cat/ca/illes-medes

Traditional varieties:
- A project to create Montgrí oil.
  The creation of a local high quality product based on integrated and organic production techniques, the conservation of the local variety of olive oil, restoration of the landscape and improvement of the local socioeconomic model.

- Demonstration farm
  Recovery of an abandoned olive grove containing the Argudell variety, and start of production using organic agricultural production techniques

Type of conservation
- Live plant collection.

Organisations the Park works with on traditional varieties:
- IRTA Mas Badia.
- Empordàlia Cooperative.
- Torroella de Montgrí Municipal Council.

PARC NATURAL DE CAP DE CREUS (NATURAL PARK)

E-mail: opalou@gencat.cat
http://parcsnaturals.gencat.cat/ca/cap-creus

Traditional varieties:
- Surveying of old varieties in Cap de Creus Natural Park (fruit trees and vegetables).
- Recovery of cultivated biodiversity in vineyards and olive trees in Cap de Creus Natural Park

Type of conservation:
- *In situ.*
- *Ex situ.*

Organisations the Park works with on traditional varieties:
- Ceps de Cap de Creus.

PARC NATURAL DE LA ZONA VOLCÀNICA DE LA GARROTXA (NATURAL PARK)

E-mail: webassol@gencat.cat
http://parcsnaturals.gencat.cat/ca/garrotxa
http://www.facebook.com/PNZonaVolcanicaGarrotxa

Traditional varieties:
The Can Jordà Centre for the Conservation of Cultivated Plants stores 88 traditional varieties of fruit trees (apricot, persimmon, cherry, quince, medlar, pear, apple, peach and plum) that are almost extinct. It also works on the characterisation and selection of varieties that may be of most interest for commercialisation in the future.

Type of conservation:
- Live plant collections.

Organisations the Park works with on traditional varieties:
- Environment and Public Health Consortium (SIGMA); manages a seed bank.
- Olot Tràmec.
- La Garrotxa Network of Agroecological Producers.
- Santa Pau Bean Growers' Association.
- EMYS Foundation.
- Riudarenes

PARC NATURAL DE LA SERRA DE MONTSANT (NATURAL PARK)

E-mail: pnmontsant@gencat.cat
http://parcsnaturals.gencat.cat/ca/serra-montsant

Traditional varieties:
Surveying and ethnobotanical research on traditional varieties carried out during the spring and summer of 2017. A group of farmers has conserved 34 traditional varieties of vegetable garden crops and 40 varieties of fruit trees (apple trees, pear trees, peach trees, vines and others).

Preliminary contacts with various organisations to reproduce, characterise and conserve the material found.

02.03.02 Other natural areas

As well as the protected natural areas (PNA) covered by the General Directorate for Environmental and Natural Policy, there is a whole range of natural and/or agricultural areas that also work to conserve the agricultural environment and rational agriculture, which includes the conservation of local varieties.

PARC NATURAL DE LA SERRA DE COLLSEROLA (NATURAL PARK)

E-mail: jvilamu@parccollserola.net
http://www.parcnaturalcollserola.cat/

Traditional varieties:
- Conservation of traditional varieties from the fruit orchards of Can Coll: plum, peach, apple and pear trees that used to be cultivated on the banks of the Llobregat in the Park.

- Recovery and conservation of the Collserola Mandó tomato: a variety cultivated from time immemorial in Collserola that had only been preserved in the farmhouse at Can Mandó (Vallvidrera, Barcelona).

Work is currently beginning with the Santa Teresa broccoli, a variety recovered by Jordi Puig (L'Espigall), Llavors Orientals and El Vallès Oriental Regional Council, which are partner institutions.

Type of conservation:
- Live plant collections.

Organisations the Park works with on traditional varieties:
- Can Comes in the El Baix Llobregat Agrarian Park.
- Miquel Agustí Foundation.

PARC AGRARI DEL BAIX LLOBREGAT (AGRARIAN PARK CONSORTIUM)

E-mail: parcagrari@diba.cat
http://parcs.diba.cat/web/BaixLlobregat
http://www.productefresc.cat

This Park is managed by the El Baix Llobregat Agrarian Park Consortium, a public Institution established by Barcelona Provincial Council, El Baix Llobregat Regional Council, Unió de Pagesos (Farmers' Union of Catalonia) and 14 municipalities with territory in the park, the Government of Catalonia and Àrea Metropolitana de Barcelona.

Arboretum of traditional varieties:
Farmers can use the varieties kept in the Arboretum to graft and market a distinctive product that identifies the Agrarian Park, which enables them to enhance the value of their production and improve their revenues.

Type of conservation:
- Live plant collection.

Organisations the Park works with on traditional varieties:
- ADV Fruita del Baix Llobregat (www.fruitsdelbaix.cat)
- Miquel Agustí Foundation.

02.04 Universities and research centres

Cultivated biodiversity conservation initiatives also take place in Catalonia's universities and research centres.

The studies do not only include the conservation aspect of phytogenetic resources (*in situ* and *ex situ*), but also the generation of knowledge about the ethnobotanical, agronomic and commercial aspects that may be of interest for conservation and/or promotion in the production sector.

In this context, research centres carry out studies to ascertain the genetic and chemical basis for consumers' preferences for these varieties.

AGRICULTURAL ENGINEERING SCHOOL (UDL)
UNIVERSITY OF LLEIDA HORTICULTURAL SEED BANK

Àstrid Ballesta
E-mail: astrid@hbj.udl.cat

Traditional varieties:
La Paeria and the UdL have carried out a joint fieldwork project surveying and inventorying the traditional varieties in Lleida vegetable gardens, which has provided plant material and knowledge. Information about the knowledge of the past and the customs associated with it was obtained by interviewing farmers and older members of the community.

This surveying includes numerous horticultural and fruit species (including tomatoes, peppers and cabbages).

Type of conservation:
-Collections of seeds of horticultural varieties at -18º C.

Partner organisations:
- Lleida City Council.

FOREST SCIENCES AND TECHNOLOGY CENTRE OF CATALONIA
CONSORTIUM - AROMATIC AND MEDICINAL PLANTS GROUP
NON-WOOD FORESTRY PRODUCTS AREA
BIOECONOMY AND GOVERNANCE PROGRAMME

Roser Cristobal i Eva Moré
http://www.ctfc.cat

Catalonia contains a vast wealth of species of aromatic and medicinal plants that have been used traditionally and are currently used on a large scale for various applications (medicinal, perfumery, as condiments, crop protection, dyes, etc.). The transition has already been made from collection to cultivation for some species. However, despite having natural populations with some very interesting and recognised chemical characteristics (chemotypes) (e.g. the Linyola chamomile), foreign commercial varieties are being cultivated, and they have often been improved due to their ornamental appearance rather than their composition of active ingredients.

There are two interesting lines of work in Catalonia: first, applying management plans adapted to the species that are still collected in order to ensure their sustainable use and second, identifying the unique wild populations in our regions with a recognised commercial demand and bringing them under cultivation.

There have been several initiatives in this area in recent years: 'The Linyola Tile Factory', which aims to recover and improve chamomile, the 'Aromatic and Medicinal Plants of the High Pyrenees Conservation Centre Association', which works to evaluate some mountain species with commercial potential, and various groups working to recover native saffron.

ENGINEERING SCHOOL (UDL)
UNIVERSITY OF LLEIDA PEAR AND APPLE
GERMOPLASM BANK (ESP089-BGUDL)

Valero Urbina i Josep Dalmases
E-mail: urbina@hbj.udl.cat i dalmases@hbj.udl.cat
http://www.fruticultura.udl.es/Fruticultura/
bancGermoplasma/localitzacio.html

The UdL Apple and Pear Germplasm Bank is part of the Collections Network in the Programme for the Conservation and Use of Plant Genetic Resources for Food and Agriculture of the National R+D+I Plan.

Traditional varieties:
There are 170 entries for pear trees and 114 for apple trees. Much of the preserved material comes from the surveys carried out in Catalonia in recent years, although there are also varieties from La Rioja, Huesca, Teruel, Salamanca, Asturias and Pontevedra, among other places. The collection is kept at the IRTA's Finca de Gimenells Experimental Station in Lleida.

Type of conservation:
- Live plant collections.

Partner organisations for traditional varieties:
- Fruit Cultivation and Viticulture Department of the Public University of Navarre.
- INIA. National Institute for Agricultural Research.
- IRTA.

INSTITUT CATALÀ DE LA VINYA I EL VI (INSTITUTION)

Xoán Elorduy Vidal and Carme Domingo Gustems
E-mail: incavi.daam@gencat.cat
http://incavi.gencat.cat/

Projects:

- The Lagravera winery:
  The vineyard at Lagravera, located in Castelló de Farfanya, retains a significant wealth of local varieties. 17 local varieties have been reported to date, of which three are new genotypes that have been named: a red variety, X8; a white variety, Pyrenees 4; and a rosé variety, red Picapoll (Domingo, C.; com. part.).

- Surveying and characterisation of grape varieties in the Pallars Sobirà region:
  The 10 varieties characterised and named highlight the urgent need to continue surveying and to extend it to collect the original genotypes, currently in danger of extinction, and to be able to describe them and safeguard them in germplasm banks, in collection plots and on in situ plantations.

- Collections of vine varieties in Espiells (Alt Penedès) and Reus (Baix Camp).

INSTITUTE OF AGRIFOOD RESEARCH AND TECHNOLOGY

E-mail: merce.rovira@irta.cat, ignasi.iglesias@irta.cat and fanny.alvaro@irta.cat
http://www.irta.cat

Germplasm Banks:
There are three germplasm banks (GB) of the hazelnut, walnut and carob tree at Mas de Bover at the IRTA. These are part of the Collections Network in the Programme for the Conservation and Use of Plant Genetic Resources for Food and Agriculture of the National R+D+I Plan. The hazelnut GB conserves 68 local varieties, varieties from other regions in Spain and 13 other countries. This GB is considered Europe's leading collection of hazelnut material. The walnut GB conserves 48 native varieties, in addition to others from Spain and 13 other European countries. 42 Catalan varieties are conserved in the carob GB, as well as others from various countries. This centre also has a large number of Catalan varieties of olive tree (49 varieties), which constitute Catalonia's olive GB, as well as an extensive collection of varieties and selections of almond trees. All the material is characterised following the international protocols for the various species. The Lleida Experimental Station has collections of foreign varieties of apple, pear and peach distributed all over Catalonia. Local varieties of apple and pear are found in Llesp (Alta Ribagorça) and apple varieties in Prades (Baix Camp). The Gimenells estate has a GB with local varieties of pear (170 varieties) and apple (148 varieties) from the Ebro Valley.

The IRTA has gathered several collections of local varieties of cereals, mainly in the Triticum genus, for research and improvement purposes. It has worked with the Centre for Plant Genetic Resources (CFR) on the creation and characterisation of the barley and durum wheat core collections.

It has collections of foreign varieties of apple, pear and peach trees. There are also some foreign apple tree varieties at the IRTA at Mas Badia and at the Finques de Llesp (Alta Ribagorça), Sant Llorenç de Morunys (Solsonès) and Prades (Baix Camp).

There is a small field with local varieties in Sort which is coordinated with Pallars Sobirà Regional Council.

Genetic improvement:
The traditional varieties studied are the basis from which future commercial varieties are obtained. Clonal selections of hazel and olive trees have been carried out. The IRTA is carrying out an ambitious genetic improvement programme for the almond, peach, apple and pear trees. New varieties of the almond and peach tree have been registered, and have been widely used and accepted in the sector.

The activities to improve cereals are primarily focused on two species: common wheat and durum wheat. Traditional varieties with desirable characteristics have been identified for use in improvement programmes. Spelt has also been improved, and two varieties have been obtained.

RESEARCH INTO BIOCULTURAL CONSERVATION

ICTA-UAB: Victòria Reyes García, victoria.reyes@uab.cat
UB: Joan Vallès, joanvalles@ub.edu
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This research line focuses on the conservation of local varieties and their associated knowledge. It emphasises the fact that in order to conserve local varieties, it is also necessary to preserve knowledge of how to manage them, and that conservation in situ, i.e. in the farmers' fields, must be encouraged. The studies carried out have shown that local varieties are agents for biocultural conservation, i.e. they contribute to maintaining biological and cultural diversity in industrialised societies. In specific terms, local varieties and the exchange thereof help to maintain cultivated diversity and the knowledge associated with it, contribute to creating a social fabric, and are related to the cultural values and social rules of the communities that handle them. They are also part of what is known as the biocultural memory – the expression in the present of a long historical legacy of the interrelations between humans and nature. The local varieties in the communities studied have been managed as a communal resource, with collective rights to the use and exchange of knowledge.

CONECT-E Project:
http://www.conecte.es

CONECT-e (Sharing Traditional Ecological Knowledge) is an interactive platform for the collection and transfer of traditional knowledge related to plants, animals, fungi, traditional varieties of crops and ecosystems. This platform aims not only to be a forum for inquiry, but also a space for meeting and exchange. The CONECT-e platform has a wiki format, so that anyone can register and share the knowledge and traditional practices they have acquired from the elderly people they know, by talking to them and finding out how they applied them on an everyday basis.

Partner organisations:
- Seed Network: Resowing and Exchanging.
- IMIDRA.
- Universidad Autónoma de Madrid.
- Àrea Metropolitana de Barcelona.
- IGOP-UAB.
- GRESC@-UAB.
- Chair in Agroecology and Food Systems, University of Vic.

UNIVERSITY OF BARCELONA – FACULTY OF BIOLOGY DEPARTMENT OF EVOLUTIONARY BIOLOGY, ECOLOGY AND ENVIRONMENTAL SCIENCES – BOTANICAL UNIT

Josep Maria Ninot Sugrañes and Marc Talavera Roma
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Research lines:
- Documentation, recovery and dissemination of traditional knowledge related to biodiversity (including wild species and traditional agricultural varieties) in Central Catalonia.
- Assessment of the degree of knowledge of useful wild species by the population of the metropolitan area.
- Collection and conservation of traditional agricultural varieties, and of wild species with potential uses in agriculture.
- Assessment of the cultivation potential of various wild species using an organic farming system based on minimal agronomic intervention, as a factor in the diversification of agrarian systems in a context of climate change.
- Study of consumer acceptance of products produced using wild species and disused traditional agricultural varieties, as an essential factor in their gradual introduction to the market.

UNIVERSITY OF VIC-UPC CHAIR IN AGROECOLOGY AND FOOD SYSTEMS

Marta Guadalupe Rivera
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The concept of agrobiodiversity involves both the tangible aspect, i.e. seeds, and the intangible aspect, which is linked to the knowledge and traditions that over the centuries have enabled those seeds to become what they are today. Its work focuses on several areas:
- The museum area: linked to the Rural Heritage Network (RHN): the Wheat Ecomuseum, where work focuses on the recovery of agricultural heritage in the Osona region involving various actors in the region:

a) Archiving and cataloguing of items used in agriculture.
b) Activities to recover and conserve seeds and associated practices, such as the five-yearly cultivation of wheat in the region.
c) Organisation of educational activities based on the different tasks in agriculture, such as harvesting and threshing wheat.

- Food and agriculture systems as complex systems, including:

a) A gender focus: e.g. women's gardens tend to be more biodiverse than those of men, and traditional knowledge differs between men and women.
b) The various interactions that take place in the food and agriculture system, composed of natural and social factors (institutions, actors), subject to impact by environmental forces (such as climate change), and political and cultural factors, which determine the future of our agrobiodiversity.
c) Links between agrobiodiversity and food security: a high level of agrobiodiversity is related to increased nutritional diversity and a higher diet quality.
d) Preservation of pastoral and agro-ecological practices

- Other research lines cover the socio-economic impacts of genetically modified crops, and the disappearance of pollinator insects.

UPC BARCELONA TECH. FUNDACIÓ MÌQUEL AGUSTÍ (FOUNDATION)

E-mail: recerca@fundaciomiquelagusti.cat
http://www.fundaciomiquelagusti.cat/

Working projects:
- Teaching in the field of genetic improvement and the conservation of agrobiodiversity.
- Conservation, recovery and improvement of traditional Catalan varieties, promoting their use in productive agriculture.
- Improvement programmes based on traditional varieties to create competitive varieties, with high levels of agronomic behaviour and a sensory profile.
- Promotion of local management of conservation, by training in the production sector.
- Unravelling of the genetic and environmental bases that determine local adaptation by traditional varieties and consumers' preferences.
- Promotion of quality labels (DOP, ITG) associated with the local cultivation of traditional varieties, as a tool in rural development.
- Design of innovative strategies to promote citizen science in the conservation of agrobiodiversity.

Types of conservation:
- Conservation ex situ: a germplasm bank with traditional horticultural varieties from all over Catalonia.
- Conservation in situ: promotion of the cultivation of traditional varieties in productive agriculture and annual cultivation of varieties in experimental seasons.

Partner organisations:
- Calçot de Valls Protected Geographical Indication – Technological innovation project for the Valls calçot onion.
- Tordera Basin Cooperative – Technological improvements in the cultivation and post-harvest of the hanging tomato.
- Castellfollit del Boix Municipal Council – Improvement of the Castellfollit del Boix bean.
- Barcelona Provincial Council – Conservation, improvement and development of the food and agriculture environment and natural areas: the Garraf cabbage.
- El Baix Llobregat Agrarian Park – High added value cabbages adapted to the conditions in El Baix Llobregat Agrarian Park.
- DARP – Cultivated Biodiversity Plan.

02.05 Regional councils and other local institutions

An effective strategy for the conservation of biodiversity requires associations that are located all over Catalonia, without forgetting the role that other regional organisations such as associations of towns can play.

CONSELL COMARCAL DE BAIX EMPORDÀ (REGIONAL COUNCIL)

E-mail: turisme@baixemporda.cat
https://baixemporda.cat/

The Baix Empordà Regional Council is committed to the recovery of some of the region's local varieties.

The project aims to restore cultivation of the ull ros bean and create a quality guarantee mark to protect the product and provide an outlet for the crop.

Recovery of the ull ros bean variety:
An initiative by the Regional Council through the Tràmec network and five producers in the region. The IRTA of Mas Badia and the Institute of Catalan Cuisine Foundation are also partners.

The town of Palau-sator organises the Bean Fair, in which a series of talks on this ancient variety takes place about and it is the basis for dishes at numerous restaurants.

https://baixemporda.cat/cuinadelemporda/ca/fesol_de_l_ull_ros.html

Recovery of the Figueres onion:
In the study phase. The economic viability of the Figueres onion is subject to assessment.

Recovery of the *relleno* apple:
The recovery of the *relleno* apple variety is in the study phase.

CONSELL COMARCAL DEL PALLARS SOBIRÀ (REGIONAL COUNCIL)

E-mail: consell@pallarssobira.cat
https://www.pallarssobira.cat/

The Regional Council has been engaged in a project to recover, conserve and revitalise local varieties of fruit, vegetables and vines since 2005. The work done consists of surveys to locate and identify all these varieties, and the creation of a seedbed to safeguard fruit varieties and an experimental field for vine varieties.

Inventory of varieties found:
Pallars Sobirà Regional Council, together with L'Alt Pirineu Natural Park, started surveying for old varieties in the Pallars Sobirà region in 2005. This project continued in 2007, and it is still in progress.

Catalogue of traditional varieties:
Pallars Sobirà Regional Council has produced and published a catalogue of old varieties of fruit and vegetables from the Pallars Sobirà region which includes a selection of recipes.

Surveying for vine varieties and the experimental field
In 2009, the Regional Council signed an agreement with the INCAVI to carry out surveys of local vine varieties, which led to the planting of an experimental plot in Sort for the conservation *in situ* of the varieties found.

Safeguarding seedbed:
The Regional Council's safeguarding seedbed, located on Bibis i Tusal farm in Sort, has enabled it to collect a large quantity of varieties of fruit from the region. When the seedbed is mature, it will be used to propagate this plant material.

The seedbed is also used as an interpretation centre for the ancient culture of the Pallars region.

Projects in progress:
- Promotion of varieties in the region's gastronomic sector: preparation of dishes, juices, jams, and consumption of freshly made products.
- Establishment of experimental fields for some varieties, to determine their behaviour under cultivation conditions.
- Promotion of the planting and sowing of these varieties by people in the Pallars to ensure their conservation and use.

CONSEL COMARCAL DEL BAGES (REGIONAL COUNCIL)

E-mail: fortunycb@ccbages.cat
http://www.ccbages.cat/

CONSELL COMARCAL DEL BAGES

Bages Regional Council, working with various organisations including the Alicia Foundation, the Miquel Agustí Foundation and the Earth Products Network, has launched various cultural and gastronomic projects based around traditional varieties.

The Bages Pantry:
A project that aims to promote high quality food and agriculture production, and to raise the profile of classic local varieties and traditionally made products, promoting gastronomy that reflects the specific characteristics of this region.
http://www.rebostbages.cat/
E-mail: rebost@ccbages.cat

Local Varieties Oil Board:
This project works with a group of producers of local olive varieties (Corbella, Vera and Verdal de Manresa) to raise awareness of their characteristics and promote their recovery.

Recovery of traditional varieties:
Work is being done to recover and improve traditional horticultural varieties such as the Cardener pink tomato and the Castellfollit del Boix bean, among others.

Bages Fogons Gastronòmics Association:
A group of restaurateurs has designed a gastronomic and geological route for the region featuring the best of Bages produce based on local and seasonal products: these include items native to the region, such as the Ral d'Avinyó pig, the white aubergine and the Mura chickpea. Gastronomy and geology join forces to promote the cuisine of the Bages region and its geological attractions in the gastronomy tours of the Central Catalonia Geopark.
http://www.elsfogonsdelbages.cat/

CONSELL COMARCAL DE LA SELVA (REGIONAL COUNCIL)

E-mail: mjordi@selva.cat
https://www.selva.cat/portal

La Selva Regional Council has carried out various activities related to the conservation of cultivated biodiversity in partnership with the company Espigall.

Inventory of traditional varieties:
A study of various local varieties has been carried out in La Selva. In total, 237 local varieties have been identified, and 21 have been described due to their unique nature and interest for the market.

Ethnobotanical information has also been compiled, including data on management of the crop, its morphology and the historical context of each variety.

CONSELL COMARCAL DEL VALLÈS ORIENTAL (REGIONAL COUNCIL)

E-mail: productesterra@vallesoriental.cat
https://productesdelvalles.wordpress.com

El Vallès Oriental Regional Council, with the support of Santa Eulàlia de Ronçana Municipal Council, Granollers Municipal Council, the Llavors Orientals Association, the Convívium Slow Food Vallès and the CuinaVO Gastronomic Association, have carried out various activities linked to preserving cultivated biodiversity in the Vallès Oriental region.

El Vallès Oriental seed bank:
Located at the Natural Sciences Museum in Granollers.

Inventory of traditional varieties:
A number of horticultural varieties have been inventoried and studied, including onions *(Campeny morada)*, beans (*ganxet, llaminera aspre, llaminera mata*, etc.) and tomatoes (*poma ple, pometa, rosa ple de penjar del Vallès*, etc.)

Old varieties of tomato:
A process of recovery and promotion of old tomato varieties has been under way in El Vallès since 2010. Around 12 varieties of tomato have been recovered by the Llavors Orientals Association – a group of horticulturalists from the Vallès region who aim to preserve horticultural cultivated biodiversity by informal research on various farms in the region.

The aim of this process is not only to recover these varieties, but to gradually incorporate them into the crops of the region's agricultural producers and obviously into the dishes eaten by the population of the Vallès. More than 35 farmers currently cultivate these varieties.

Recovery of ancient seeds:
Since 2010, the El Vallès Oriental Regional Council, with the support of the Llavors Orientals Association, has been promoting and supporting processes to recover old vegetable garden varieties that used to be grown in El Vallès, and which contribute to the region's biodiversity.

In 2010, two experimental nurseries were launched under the auspices of Pep Salsetes, to recover old varieties at the La Marineta Resources Centre in Parets del Vallès and at the Hort de l'Expelt nursery in Santa Eulàlia de Ronçana, where tests are being carried out to recover old varieties of tomato, lettuce, bean and cabbage, among others.

Partner organisations:
Slow Food Vallès, Llavors Orientals, CuinaVO, Santa Eulàlia de Ronçana Municipal Council, Granollers Municipal Council, Granollers Natural Sciences Museum.

CONSELL COMARCAL DE LA GARROTXA (REGIONAL COUNCIL)

E-mail: xpujol@consorcisigma.org
http://www.garrotxa.cat/

In 2002, La Garrotxa Regional Council and Olot Municipal Council created the La Garrotxa Public Health and Environment Consortium (SIGMA) to manage issues related to the environment and public health in the Garrotxa region.

The Consortium carries out various projects based around the conservation of traditional varieties. The La Garrotxa seed bank stores an important amount of local plant material from this region.

TAULA DEL SÉNIA (ASSOCIATION OF MUNICIPALITIES)

M.ª Teresa Adell Pons (Gerent)
E-mail: gerencia@tauladelsenia.org

The Taula del Sénia Association of Muncipalities is a local association formed by the municipal councils of 27 municipalities (15 in the Valencia Community, 9 in Catalonia and 3 in Aragon), located in the centre of the Barcelona–Valencia–Zaragoza triangle, which have a shared geography, history, language and culture, as well as the world's highest concentration of ancient olive groves.

The Association has inventoried the millennial olive groves in the Sénia region, which amount to 4,960 trees (with a trunk perimeter of more than 3.50 m at 1.30 m from the ground) in 22 villages, of which 96% belong to the Farga variety.

There are 1,847 trees (37%) in the Catalan part of the area. 1,372 of them are in Ulldecona, 178 in Sénia, 134 in Godall and 84 in Freginals.

Projects and/or actions:

Ancient olive trees in the Sénia Territory: The inventory of ancient olive trees in the Sénia Territory aims to ensure their conservation and take steps to improve the quality of the oils, with the involvement of other sectors: restaurants, tourism, trade ... and also in aspects of the environment, heritage, culture and landscape.

- Arión Natural Museum (Ulldecona). Ulldecona Tourist Information Office. Tel. 619770869: As a result of an agreement between the owners and Ulldecona Municipal Council, the tourist office carries out guided visits to the Arión Natural Museum, where it is possible to admire 35 ancient olive trees within an area of just over a hectare, including the 'Farga de l'Arión', which, at 8.03 m, is the largest olive tree in Catalonia, and was planted in 314 AD according to the University of Madrid. It was also declared a monumental tree by the Government of Catalonia in 1997, and was awarded the AEMO Prize as Spain's best monumental olive tree in 2006.

- Other museums/areas: Near the area, in Valencia (La Jana), there is another museum with 21 ancient olive trees, as well as 12 smaller areas, where some monumental specimens can be visited. There are 4 in the Catalan area, in Alcanar (on municipally owned land) and in La Sénia, Godall and La Foia d'Ulldecona, thanks to agreements with the owners.

- Paths with ancient olive trees: path that contain various routes and which links the municipalities and points of interest: museums, interpretation centres, Iberian villages. They also cross the landscape and enable users to admire spectacularly shaped olive groves and crop fields, with dry stone walls and unique fauna and flora.

Figure 2. *La Farga de l'Arión, the largest and oldest olive tree in Catalonia (1,704 years old). Ulldecona. Source: Santi Martorell.*

02.06 The production sector

The food and agriculture sector in Catalonia is a crucial part of our economy. Initiatives to market traditional varieties have become increasingly common in recent years, aimed at meeting consumers' needs.

02.06.01 Catalan Federation of Agricultural Cooperatives (FCAC)

The Federation includes several cooperatives that work to maintain the local varieties that are best adapted to the agricultural and climate conditions, pests and diseases in their region and have a recognised organoleptic value. Some examples include:

Agrària del Vallès, SCCL (Les Franqueses del Vallès)

This cooperative is working to prevent the disappearance of the *ganxet* bean, in a conventional and organic Protected Designation of Origin, and the *menut* chickpea, a traditional local variety of this legume that has been recovered in recent years. It also has a research project under way to confirm that the *vera* olive trees cultivated in this area are the same in morphological and molecular terms as the variety known as *vera* in the germplasm banks of the IRTA and the IFAPA-Cordoba Andalusian Research Institute. The initial results suggest that they are not the same, but they do appear to have the same genetic origin, which is why steps are being taken to register the local variety as the Vera del Vallès. The process has required the registration of a cutting located on a farm in Caldes de Montbui and its grafting to obtain the initial plant and reserve. Estimates suggest that the mother plant will soon be available.

Celler Cooperatiu d'Espolla, SCCL (Espolla)

This is one of the longest established wine-producing companies in the Alt Empordà region, although they also produce small amounts of oil from some traditional Empordà varieties, such as the Corivell and Argudell, from ancient trees, which strike a delicate balance between sweet and bitter.

Empordàlia, SCCL (Pau)

De la mateixa manera que en el cas anterior, aquesta cooperativa produeix vins i olis. Aquests últims principalment de la varietat argudell, la més típica de l'Albera.

Figure 3. *Saffron is a crop that has a long history in Catalonia. Masia de Llens, Rasquera (Baix Ebre). Source: Santi Álvarez*

Figure 4. *A characteristic of the ull ros bean variety is that it has both a flower and dry green pods at the same time, which makes it difficult to harvest. The ull ros bean recovery group is currently working to enhance this bean. Salvador Mencio's nursery at Can Puig. Torroella de Fluvià. (Empordà). Source: Joan Català Pagès*

Agrícola del Progrés Garbí, SCCL (Malgrat de Mar) and Conca de la Tordera, SCCL (Palafolls)

These cooperatives are part of the second phase of the TRADITOM project. In 2015, a seed bank was created with 1,500 traditional European tomato varieties, from which large quantities of genomic data have been extracted.

In Catalonia, the tests are carried out in the municipalities of Palafolls and Viladecans, and have included tomato varieties such as the *penjar, montserrat, palosanto-pometa* and *pera de Girona*.

Vinícola i Secció de Crèdit Sant Isidre de Nulles, SCCL (Nulles)

This winery is a unique project involving the rediscovery of the red xarello, a forgotten age-old variety that was formerly known as *cartoixà* de la *marina*, with which they aim to restore the memory of one of the most unique native varieties of the coast of Tarragona. The red xarello had been forgotten, and replaced by other more productive varieties or mixed with the more plentiful xarello in many wines.

In grapes for wine production, many cooperatives continue to carry out typicity research in wine's various denominations of origin, based on native grape varieties: white grenache in Terra Alta, tourbat in the Conca de Barberà, picapoll in the Pla de Bages, red grenache in the Empordà and sumoll in the Penedès.

02.06.02 The vision Unió de Pagesos (UP), (Farmer's Union)

The European legal framework only permits the commercialisation, for compensation or otherwise, of all plant material that is registered or listed in the European Union's Common catalogue of varieties of agricultural plant species (the community catalogue), or in the national Catalogue of commercial and protected varieties. This means that any plant material that is not registered in the European or Spanish catalogue cannot be given away, exchanged or sold. However, it is difficult for local varieties to meet the requirements for registration, since there tends to be greater variability between individuals of the same variety, and in the transmission of the variety's characteristics from one generation to another (i.e. they are not very homogeneous or stable). This means it is difficult for them to meet the technical specifications of homogeneity and stability established in the regulations in order to be registered.

Figure 5. *Conservation ex situ. Store of the Era Association Agroecological Resources Area. Preserving seeds correctly is a key factor in ensuring the future viability of this plant material. Source: Toni Sirera.*

Figure 5. Conservation ex situ. Store of the Era Association Agroecological Resources Area. Preserving seeds correctly is a key factor in ensuring the future viability of this plant material. Photograph: Toni Sirera.

However, during the United Nations Conference on Environment and Development held in Rio de Janeiro from 3 to 14 June 1992, the European Community, or all its member states, signed the Convention on biological diversity. This meant that by incorporating the agreements of the Convention on biological diversity in its legal system, and by means of several community directives, the European Union established some exceptions for conservation varieties, which is the technical term used for local or native varieties that are also endangered by genetic erosion. To facilitate the registration of conservation varieties, Member States are able to exempt conservation varieties from some of the homogeneity and stability requirements for inclusion in the registration of commercial varieties

02.06.03 The vision of Young Farmers and Livestock Farmers of Catalonia (JARC)

The agriculture of the future means that we must consider new critical challenges such as climate change and environmental changes, to which a partial solution can be found in concepts as old as the agriculture itself.

The search for and recovery of local varieties, and the use of their genetic diversity, is the basis for developing improved crops, which are adapted to the environment and provide high yields. Together with a vision of farming as a complex and biologically diverse agricultural system, this will enable sustainable agro-ecosystems to evolve. To that end, they believe that research and technological advancement initiatives are of paramount importance, and require the commitment and support of technology centres, universities, research institutes and the government; and transferring knowledge and advice to farmers is equally important, to address the issue from an ecological, social and cultural perspective.

02.07 Associations of plant material production companies

ANOVE

E-mail: administracion@anove.es
http://www.anove.es

The National Association of Plant Breeders (ANOVE) is a private non-profit association, which includes private companies and public centres that generate added value in the food and agriculture sector through the research, development and exploitation of new plant varieties.

ANOVE consists of 53 organisations, of which 51 are private companies and 2 are public research centres. The companies located in Catalonia are Llavors Fitó, Llavors Batlle, Agromillora and the IRTA. The association works in four areas: cereals; horticultural and ornamental plants; fruit trees and nuts; corn, oilseed crops and industrial crops.

Biodiversity is essential for obtaining new plant varieties. The breeder's work consists of creating biodiversity. This is an essential factor for breeders, since it is necessary for adapting the new varieties to the challenges that face them: climate change, new diseases, adaptation of crops to extreme conditions.

The more biodiversity a breeder has, the more likely they are to obtain varieties with more value for the producer and for society. Without biodiversity, and without sources of resistance, it is impossible to perform an effective selection for improvement, and fighting against diseases would be even more difficult.

APROSE

E-mail: info@aprose.es
http://www.aprose.es

APROSE is a Spanish professional association of seed companies with 45 member companies, of which 7 are Catalan: AGRARIA ESTANY S.L., AGRUSA, AKIRA SEEDS S.L., DIAMOND SEEDS S.L., MAGNUM SEEDS IBERIA S.L., ROCALBA S.A. and EL SOLC S.L.

Biodiversity is necessary for improvement, because without genetic variability it is impossible to obtain new genotypes or to provide solutions to new challenges. This variability also helps to improve existing varieties by making them more resistant to disease and improving their quality.

Seed companies are the means of transfer of this improvement, as they pass on these developments to the farmer and ultimately to the end consumer.

As members of the European Seed Association (ESA), APROSE contributes to the redistribution of the benefits of genetic enhancement to countries which are the source of variability (Nagoya Protocol, International Treaty on Plant Genetic Resources for Food and Agriculture).

ASSOCIACIÓ CATALANA DE MULTIPLICADORS DE LLAVORS (ACML) (ASSOCIATION)

E-mail: multiplicadorsllavors@gmail.com
http://www.multiplicadorsdellavors.org

This organisation represents most of the companies producing and reproducing cereal seeds in Catalonia. It was created primarily to establish unity of action, and above all to engage in dialogue with the various government bodies.

Its opinion on the phytogenetic resources and local varieties in particular is that they believe that there is a need to improve the productivity, profitability and protection of farms in Catalonia.

These principles cannot be implemented without considering the innovation that the research in the Green Revolution has produced. However, old plant material warrants considerable attention, provided that it has advantages that it can bring to the entire agrarian and socio-economic cycle.

FEDERACIÓ DE VIVERISTES (NURSERIE'S FEDERATION)

E-mail: federacio@viveristes.cat

The associations of Nurseries of Barcelona, Girona, Lleida and Tarragona make up the Federation of Nurseries of Catalonia, and each area has its own speciality: fruit trees in Lleida, seasonal and flowering plants in Barcelona, trees, shrubs and conifers in Girona and Mediterranean trees and shrubs, fruit and citrus trees in Tarragona. Along with each type of plant, there are also many cultivated species and varieties, amounting to more than 2,000 in total, which also provide associated beneficial fauna, such as pollinators when there are no other flowering plants.

Some nurseries specialise in native plants for environmental projects and gardening with low levels of water consumption. However, non-native plants are not a threat to our green spaces, except for invasive species.

Plants from elsewhere contribute to diversification and to making green areas more sustainable.

Green urban areas require plants that are better adapted to local conditions, which need little maintenance and little water, and these factors must prevail over whether they are native species. Otherwise, there will be no distinction between gardens and forests. New varieties are introduced each year in the field of fruit cultivation as a result of research, based on the trends and needs of the agricultural sector.

COOKING AND BIODIVERSITY

FUNDACIÓ ALÍCIA (FOUNDATION)

Biodiversity must be preserved due to its potential as a phytogenetic resource. But more importantly, vegetables, fruits, livestock and all other local food products must be planted, cultivated and reared every year. And if this is to happen, they have to be eaten. And if they are to be eaten, they have to be cooked, and cooked in dishes that include them; in other words, in local cuisine.

The Alicia Foundation works to truly recover and enhance local products through cooking, because their survival in the field is only assured of people really eat and enjoy them.

For more information, please visit: www.alicia.cat.

The cooks of the Fogons Gastronòmics del Bages Association. Source: Fogons Gastronòmics del Bages Association

Initiatives such as the one by the Alicia Foundation highlight local varieties in restaurants. Photograph: Toni Sirera.

FOGONS GASTRONÒMICS DEL BAGES ASSOCIATION

The aim of the Association, apart from establishing links between its members, is to work with local and native products and promote the region's gastronomy. To that end, they organise seminars and events, both inside and outside the Bages region, to demonstrate their cuisine.

Their activities include:

- Development of four gastronomic seasons (slaughter season, cod season, season for cooking products from the Bages vegetable garden, wild mushroom season).
- Recovery of traditional recipes (e.g. Manresa style cod from the recipes of Ignasi Domènec, Manresa's master chef from the early twentieth century)
- Bages wines on menus, with special emphasis on those made with native grape varieties such as the picapoll, sumoll and mandó.
- Use of native products: the Manresa green cabbage, the Manresa white aubergine, all the varieties of tomato...

They engage in a locally sourced economy, and follow criteria based on environmental sustainability. They seek a self-sufficient market, a differentiated, unique and productive range of cuisine, and to restore the concept of the pantry (by producing preserves).

Further information:

- Ignasi Sala Blanch, chef at Mas de la Sala in Sallent (www.masdelasala.com)
- Bages Gastronomic Stoves Association (www.elsfogonsdelbages.cat).

PEP SALSETES – A PIONEER IN THE RECOVERY OF LOCAL SEEDS

Pep Salsetes describes himself as an enthusiastic chef and horticulturalist, a producer and disseminator of traditional, historical, festive cuisine, etc.

He believes that local varieties are our roots and our reference for taste, among other things.

In the Vallès Oriental area, there is a seed bank located at the La Tela Natural Science Museum in Granollers, which contains around 120 local horticultural varieties; mainly beans, tomatoes, cabbages, lettuce, endives, onions, etc. These vegetables are marvellous in the kitchen, for creating traditional dishes such as trinxat with 'toad skin' cabbage and scalded soups made with water from boiling Santa Teresa broccoli.

The limitations are those inherent in these old products and their reintroduction: the production levels for supplying restaurants and individuals are limited.

The region's recovery association, Llavors Orientals, also organises a Tomato Fair every year.

Further information:

http://www.llavorsvallesoriental.cat.

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